A Satellite Data Model for the AFRL Responsive Space Initiative

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Introduction

- 6 day satellite
  - Insufficient time to develop software
  - Insufficient time to develop hardware
- Attribute based publish/subscribe
Example

- A thermostat system is to be built
- Requires
  - Heating Element  
  - Temperature Sensor
  - Control Program
- One of each is selected and added to the system
- The Control Program queries the SDM for a generic heating element and temperature sensor
- The SDM matches the generic request with the available devices
- Point-to-point communication between devices and the control program is initiated
System Overview

- Core Components
  - Data Manager
  - Task Manager
  - Process Manager
  - Sensor Manager
System Overview

- **Applications**
  - Data/Service Consumers
  - Data/Service Producers
System Overview

- Devices
  - Heavyweight Devices
  - Lightweight Devices
  - Legacy Devices
Auto configuration

- Initialization
- Discovery
- Control
- Failure Recovery
Data Description

- xTEDS
  - IEEE 1451
- Common Data Dictionary
- Physical Location
SDM protocols

- **SPA-U**
  - Simple protocol used by lightweight devices, run on a modified USB network

- **SPA-E**
  - Full SDM message protocol designed for ethernet

- **SPA-S**
  - Future extension of SDM protocol designed for SpaceWire
SDM API

- **Message Classes**
  - These classes describe the SDM message protocol

- **Message Manipulator**
  - Aids in the marshalling/unmarshalling of generic messages

- **Subscription Manager**
  - Handles tasks common to all data publishers
Conclusion

- SDM is a developing standard for rapid satellite deployment
- Attribute based publish/subscribe
- Attribute based auto configuration